

Title/Subject: Standard Test Procedure – Dielectric Strength Test		
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1.0 PURPOSE

- 1.1 This test procedure is used to determine whether a component complies with the dielectric test requirements of ACRI2001 “Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus”, Section 9.6.
- 1.2 To provide a person knowledgeable in the appropriate technical field with a written procedure that will assure consistent repeatable test data and results independent of the person conducting the test.

2.0 SCOPE

This Standard Test Procedure (STP) applies to components submitted for test as an isolating component for use in intrinsically safe apparatus and associated apparatus evaluated, approved, or certified per 30 CFR Parts 18, 22, 23, and 27.

3.0 REFERENCES

- 3.1 ACRI2001 “Criteria for the Evaluation and Test of Intrinsically Safe Apparatus and Associated Apparatus”
- 3.2 30 CFR Part 18 “Electric Motor-Driven Mine Equipment and Accessories”
- 3.3 30 CFR Part 22 “Portable Methane Detectors”
- 3.4 30 CFR Part 23 “Telephones and Signaling Devices”
- 3.5 30 CFR Part 27 “Methane-Monitoring Systems”

4.0 DEFINITIONS

- 4.1 **IS Side** - The side of the component connected to the intrinsically safe circuit of the associated apparatus.
- 4.2 **Non-IS Side** - The side of the component connected to the non-intrinsically safe circuit of the associated apparatus.
- 4.3 **Representative Sample** - A sample that is verified to comply with the documentation and specifications and is considered typical of the design.

5.0 TEST EQUIPMENT

- 5.1 A withstand/insulation tester (Kikusui Model 8850 or equivalent). The test voltage shall be an alternating voltage of a substantially sinusoidal waveform at a frequency between 48 Hz and 62 Hz or a dc voltage with no more than a 3 percent peak to peak ripple.
- 5.2 A stopwatch if the withstand/insulation tester does not have a built-in timer.

6.0 TEST SAMPLES

- 6.1 Three (3) representative samples of each type relay.
- 6.2 Three (3) representative samples of each type capacitor.
- 6.3 At least a three (3) foot representative sample of each type of cable or conductor.

7.0 PROCEDURES

- 7.1 Conduct the test at an ambient temperature of $25 \pm 10^{\circ}\text{C}$.
- 7.2 Set the withstand/insulation tester breakdown or cutoff current to 5 milliamperes, if equipped.
- 7.3 For relays, connect all leads (pins) on the Non-IS side together, and connect all leads (pins) on the IS side together.
- 7.4 For cables or conductors, the insulation of each different type shall be tightly wrapped with metal foil along at least 30 inches of the sample, and each type tested once.



**WARNING: HIGH VOLTAGE!
DO NOT CONTACT LIVE CONDUCTORS.
TEST COMPONENT IN A SUITABLE ENCLOSURE.
COMPONENT UNDER TEST MAY BURST INTO FRAGMENTS OR
FLAME DURING THE TEST.**

- 7.5 With no sample connected, set the withstand/insulation tester voltage according to the following chart.

Type of Component	Test Voltage (ACrms)	Test Voltage (DC)	Where applied
Relay	$4U_1$ or 2500, whichever is greater	$5.66 U_1$ or 3536, whichever is greater	Between IS and Non-IS terminals
Capacitor	$2U_2 + 1000$	$2.83 U_2 + 1414$	Between input and output leads
Cable or insulated conductor isolating part of an IS circuit or separate IS circuits	$2U_3$ or 500, whichever is greater	$2.83 U_3$ or 707, whichever is greater	Between metal foil and conductor
Cable or insulated conductor isolating Non-IS and IS circuits	$2U_4 + 1000$, with a minimum of 1500	$2.83U_4 + 1414$, with a minimum of 2121	Between metal foil and conductor

Where: U_1 is the highest nominal operating voltage of the device,

U_2 is the voltage across the two capacitors (voltage is applied to a single capacitor),

U_3 is the normal working voltage of the intrinsically safe circuit, and

U_4 is the sum of the rms values of the voltages of the intrinsically safe circuit and the non-intrinsically safe circuit.

- 7.6 Connect the withstand/insulation tester leads to the application points of the sample given in the chart.
- 7.7 Increase the voltage steadily to the desired value in a period not less than 10 seconds and then maintained for at least 60 seconds.
- 7.8 Record the test voltage, time the voltage was applied, and whether or not the device under test passed the dielectric strength test.

8.0 TEST DATA

- 8.1 For relays and capacitors, the manufacturer and manufacturer's model or part number of the device under test.
- 8.2 For relays, a schematic diagram identifying the IS and Non-IS terminals and describing how the relay was connected in the test circuit.

- 8.3 For relays and capacitors, manufacturer's specified minimum dielectric withstand voltage between the input and output, and the internal creepage and clearance distances, if specified.
 - 8.4 For cables or conductors, the manufacturer and part number, the voltage rating, and the radial thickness of insulation.
 - 8.5 Test voltage.
 - 8.6 Length of time the voltage was applied.
 - 8.7 Test Results: Pass or Fail.
 - 8.8 Test equipment used during testing. This should include: manufacturer, model number, a means to uniquely identify the equipment (e.g. serial number, property number, etc.), and calibration due date for each piece of equipment.
- 9.0 PASS / FAIL CRITERIA

There shall be no breakdown of the insulation or dielectric between the test points as indicated by the test equipment (5mA + 5%).